Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

New generation of highly sensitive luminescent thermometers operating in optical window of biological tissues

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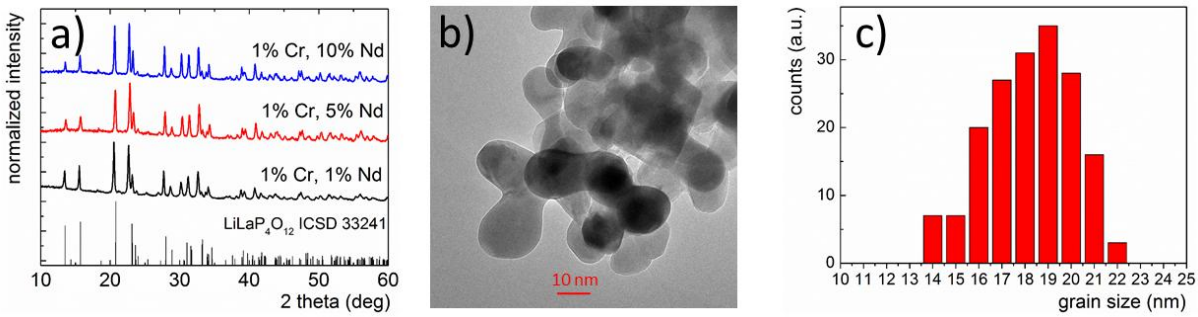

Fig. S1. X-ray diffraction patterns of $LiLaP_4O_{12}$:Cr,Nd nanocrystals-a; and representative TEM image –b with grain size distribution-c.

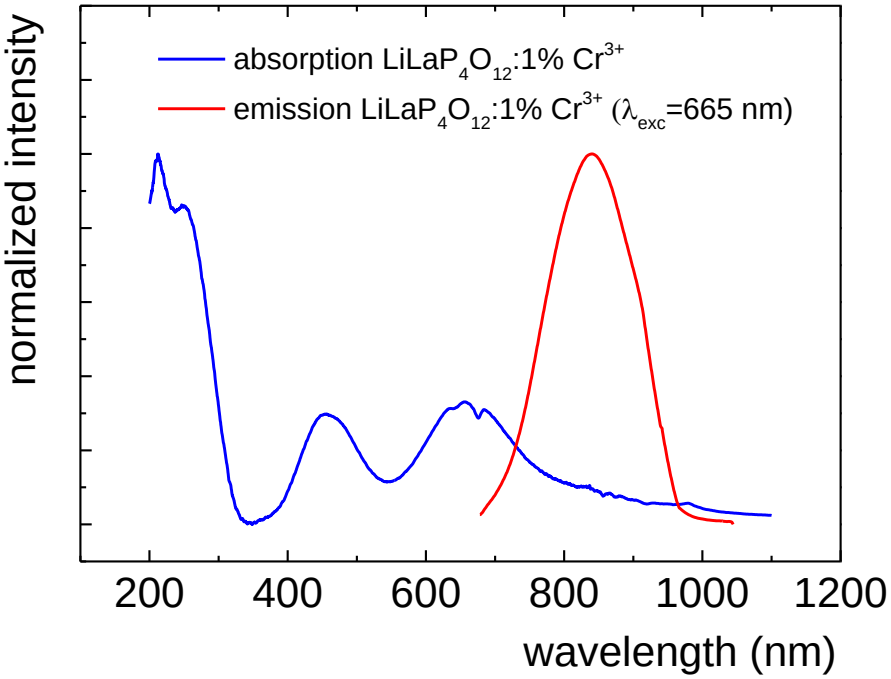

Fig. S2. Comparison of absorption and emission spectra of $LiLaP_4O_{12}$:1%Cr nanocrystals

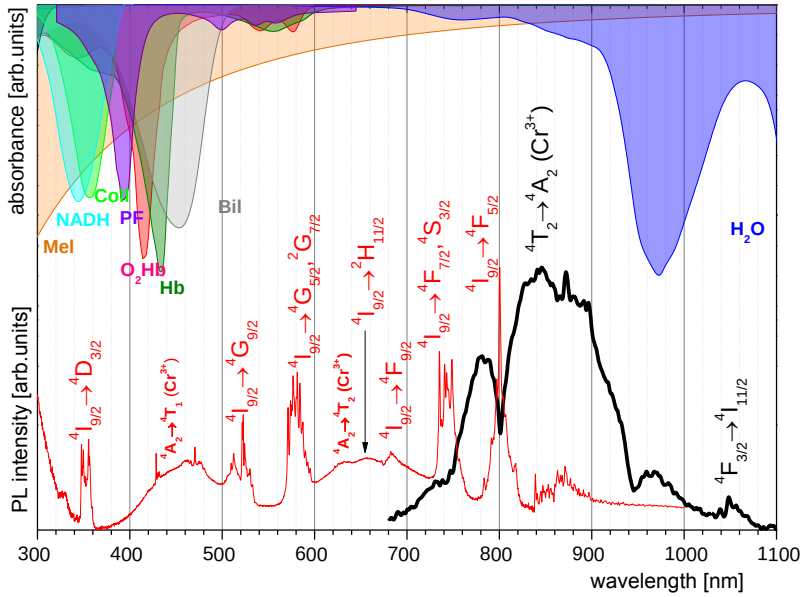

Fig. S 3. Comparison of absorption and emission spectra of $LiLaP_4O_{12}$:Cr,Nd nanocrystals with absorption of biological molecules Mel-melanine, NADH – Nicotinamide adenine dinucleotide, coll – collagen, PF – protophorphirin, O2Hb – oxygenated hemoglobin, Hb- deoxygenated hemoglobin, Bil-Billirubine, H2O - water

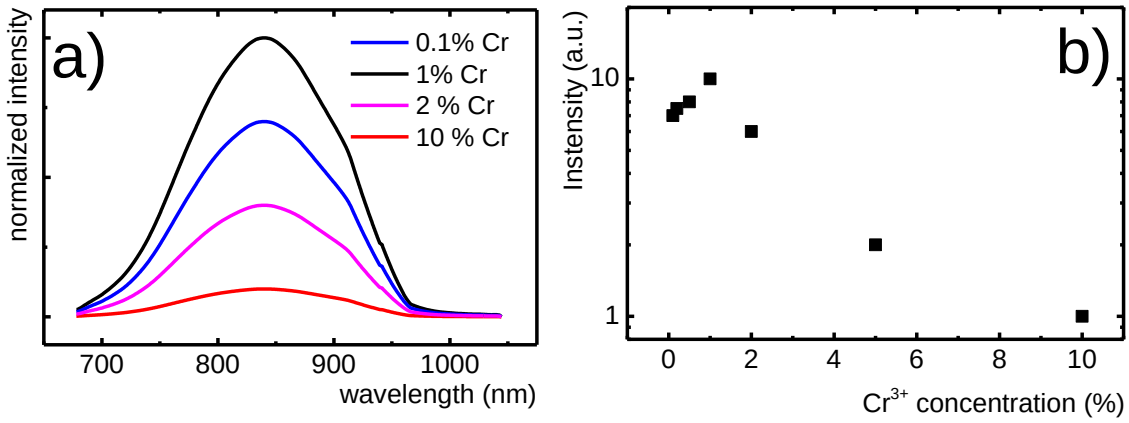

Fig. S4. Emission spectra of $LiLaP_4O_{12}$:Cr nanocrystals with different concentration of Cr^{3+} ions –a and integral emission intensity as a function of Cr^{3+} concentration-b

The crossing point between ground state parabola and $^4T_2$ parabola of Cr^{3+} ion in $LiLaP_4O_{12}$ nanocrystals (activation energy) was determined basing on temperature dependence of emission intensity of $LiLaP_4O_{12}$:Cr nanocrystals for different concentration of Cr^{3+} ions (Fig. S4) using following equation:

$$I_{em} = \frac{I_0}{1+\exp\left(\frac{\Delta E}{kT}\right)} \qquad \text{(S.1)}$$

where

I_{em}- emission intensity

I_0- emission intensity at the lowest temperature

ΔE- activation energy

T-temperature

k- Boltzmann constant

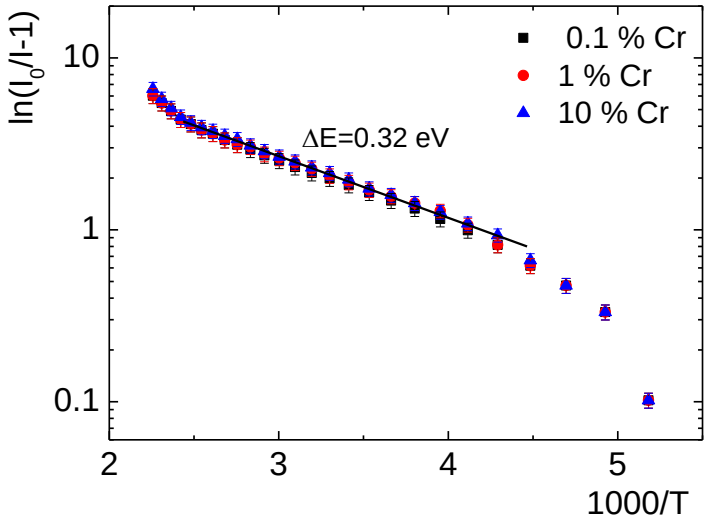

Fig. S5. Temperature dependence of emission intensity of $LiLaP_4O_{12}$:Cr nanocrystals

Reproducibility of temperature measurement using $LiLaP_4O_{12}$:1%Cr^{3+},10%Nd^{3+} nanocrystals as a luminescent thermometer was confirmed via 6 cooling-heating cycles measurements at two temperatures 0°C and 50°C. At each temperature emission spectra was recorded after 3 minutes.

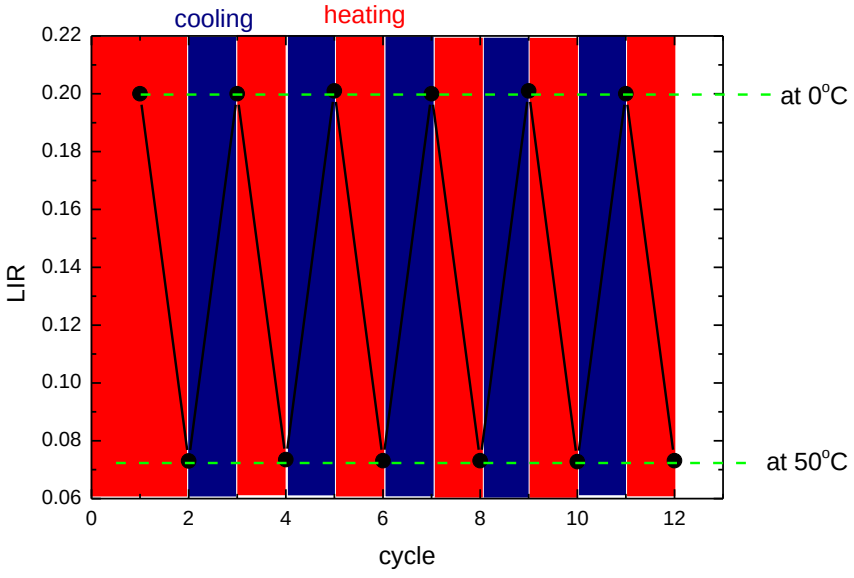

Fig. S6 Reproducibility of LIR measurements for $LiLaP_4O_{12}$:1%Cr^{3+},10%Nd^{3+} nanocrystals in cooling-heating cycles.